

Name: _____

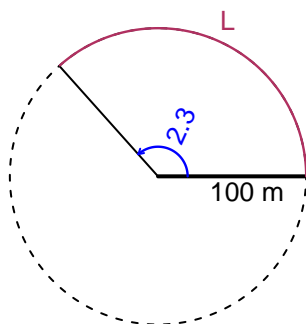
Date: _____

Trig Final (Solution v7)

- You can use a calculator (like [Desmos](#))
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 100 meters. The angle measure is 2.3 radians. How long is the arc in meters?

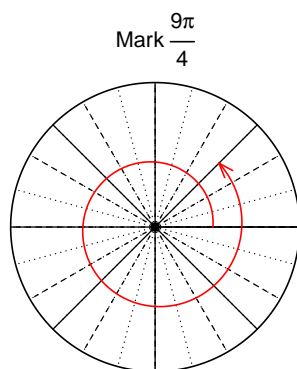


$$\theta = \frac{L}{r} \quad r = \frac{L}{\theta} \quad L = r\theta$$

$L = 230$ meters.

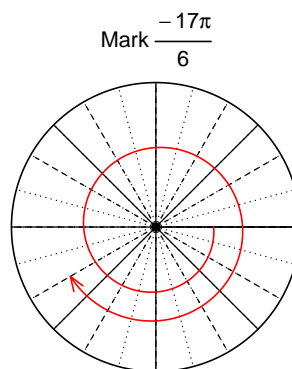
Question 2

Consider angles $\frac{9\pi}{4}$ and $-\frac{17\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{9\pi}{4}\right)$ and $\sin\left(-\frac{17\pi}{6}\right)$ by using a unit circle (provided separately).



Find $\cos(9\pi/4)$

$$\cos(9\pi/4) = \frac{\sqrt{2}}{2}$$



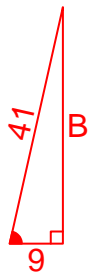
Find $\sin(-17\pi/6)$

$$\sin(-17\pi/6) = -\frac{1}{2}$$

Question 3

If $\cos(\theta) = \frac{9}{41}$, and θ is in quadrant IV, determine an exact value for $\sin(\theta)$.

Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



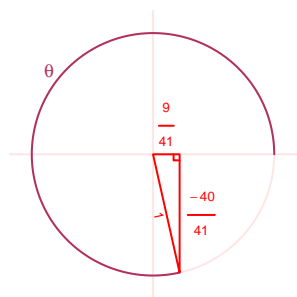
Solve the Pythagorean Equation

$$9^2 + B^2 = 41^2$$

$$B = \sqrt{41^2 - 9^2}$$

$$B = 40$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\sin(\theta) = \frac{-40}{41}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 8.97 meters, a midline at $y = 3.75$ meters, and a frequency of 7.76 Hz. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 8.97 \sin(2\pi 7.76t) + 3.75$$

or

$$y = 8.97 \sin(15.52\pi t) + 3.75$$

or

$$y = 8.97 \sin(48.76t) + 3.75$$